Analysis of outcomes of anesthesia management in renal transplant patient

Anesthesia management in renal transplant patient

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Abstract

Aim: This study aimed to investigate the effects of anesthesia on organ functions in patients undergoing renal transplantation in our center.

Material and Methods: Data of patients undergoing renal transplantation at Ankara Numune Training and Research Hospital between 2011 and 2014 were retrospectively reviewed. Data of patients were accessed through the analysis of organ transplant follow-up charts, anesthesia follow-up forms and their electronic records at the system.

Results: Of the 42 renal transplantation patients, 17 (40%) had living donors and 25 (60%) had a transplant from a cadaver. None of the patients had complications at the time of anesthesia induction; sevoflurane was the most commonly used anesthetic gas, and no statistically significant relationship was found between types of anesthetic gas and postoperative renal functions. Cold ischemia time was found to be statistically longer in patients with delayed graft function, and the incidence of delayed graft function was higher in cadaveric renal transplant recipients than in patients receiving living donor renal transplant. The development of delayed graft function was not found to be statistically related to the administered anesthetic gases. There was no significant difference for patients in terms of anesthetic agent with regard to post-renal transplant laboratory values.

Discussion: In this patient group, where many factors play a role in the survival of the renal graft and the kidney recipient, there is no single proven technique for anesthesia management. The anesthesia and surgery management techniques in our study had no adverse effect on patient and graft survival.

Keywords

Anesthesia; Renal; Transplant

Introduction

Chronic kidney disease is an important health problem all around the world with increasing rates of incidence. Patients with end statege renal failure (ESRF) need a renal replacement treatment (hemodialysis, peritoneal dialysis or renal transplantation) to survive. Renal transplantation is the ideal renal replacement treatment option for ESRF patients because it provides higher survival rates and a better quality of life than hemodialysis and peritoneal dialysis [1]. Anesthesia in renal transplantation was defined in the early 1960s. Much progress has been achieved today through changes in anesthesia management compared to those times when the recipient was administered spinal anesthesia and only provided non-invasive blood pressure and electrocardiogram (ECG) monitorization. ESRF often results in dysfunction in other organs and systems, and responses to anesthetic agents in such patients cannot be fully anticipated. In addition, these patients are at high risk for perioperative complications due to their underlying diseases [1-3].

In this study, we aimed to evaluate the anesthesia and surgery management, early and late anesthetic and surgical complications, patient and graft survival rates for the patients undergoing renal transplant at our hospital and present their relationship with the administered anesthesia method.

Material and Methods

Forty-two patients undergoing renal transplantation at Ankara Numune Training and Research Hospital between May 2011 and October 2014 were included in the study. Data were accessed through the analysis of patient files, patient information recorded at the computer system of our hospital, and anesthesia follow-up forms. Based on the renal transplantation date, patient data including age, gender, body weight, American Society of Anesthesiologists (ASA) score, comorbid diseases, reason for kidney failure, type of dialysis, duration of dialysis, type of donor, duration of surgery, applied interventional procedures, administered anesthetic agents, diuretic drugs, vasoactive drugs, administered fluid therapies, central venous pressure (CVP) values right before and after surgery, cold ischemia times, urination after intraoperative anastomosis, postoperative infections, postoperative complications of anesthesia and surgery, rejection development, length of hospital stay, mortality information and laboratory values for hemogram and biochemistry in the preoperative period, on the 1st, 3rd, and 5th postoperative days and at the time of discharge were retrospectively reviewed.

Statistical data were analyzed with SPSS 20 package program. Friedman's Two-Way ANOVA was used in the analysis of more than two independent variables as they were non-normally distributed, and when significant differences were observed, Multiple Comparison Tests were used to determine the variables differing from each other. In the analysis of differences between groups, the Mann-Whitney U test and the Kruskal-Wallis H Test were used when the variables were not normally distributed. Since the number of units was over 20, standardized z-values were given for the Mann- Whitney U Test. When significant differences were detected with the Kruskal-Wallis H test, the Post-Hoc Multiple Comparison Test was applied to identify the groups with differences. The Pairedt- test was used to analyze the difference between two dependent variables if they were normally distributed. The Chi-square analysis was applied to examine the correlation between the groups of nominal variables. If the expected values in the cells did not have enough volume, the Pearson Chi-Square analysis was applied with the help of Monte Carlo Simulation. Spearman's Correlation Coefficient was used to investigate the relationships between non-normally distributed variables.

For the interpretation of the results, 0.05 was accepted as the level of significance, and while $p<0.05$ indicated a significant difference/correlation, $p>0.05$ showed no significant difference/correlation.

Results

Twenty-five patients received kidneys from deceased donors. Of the 17 patients who had kidneys from living donors, 3 received from his/her spouse, 8 received from his/her mother, 2 received from his/her father, 4 received from his/her sibling (i.e 14 living related and 3 living unrelated donors). The demographic data of the patients are summarized in Table 1.

When the patients were analyzed in terms of their comorbidities, 18 patients (42.8%) were found to have essential hypertension and 4 patients (9.5%) had goiter. Four (9.5%) patients underwent preemptive renal transplantation without renal replacement therapy, 10 (23.8%) underwent peritoneal dialysis in the pre-transplant period, 23 (54.7%) underwent hemodialysis and 6 (14.2%) patients underwent both peritoneal dialysis and hemodialysis in various periods during their follow-up. The donor source was living in 17 patients (40.4%) and 25 patients (59.5%) had a renal transplant from a cadaver.

While hypertensive nephropathy was the most common etiology in the patient group, the etiology was idiopathic in half of the patients. The etiology for renal failure of the patients is presented in Table 2.

Standard noninvasive monitoring and invasive central venous pressure (CVP) monitoring via an internal jugular vein catheter were applied to the patients who were taken to the operation table. Invasive blood pressure monitoring was performed through the radial artery in 20 (47.6%) patients. As a premedication, 2 mg midazolam was administered intravenously and operations were performed under general anesthesia. The drugs used for anesthesia induction and maintenance are shown in Table 3.

The dose of fentanyl used in the induction of anesthesia was 101±50.9 μg. Propofol and remifentanil infusion and a mixture of 50% air + 50% oxygen were administered to patients in the total intravenous anesthesia (TIVA) group. It was observed that while 50% nitrogen protoxide + 50% oxygen mixture was used in 32 patients (76.1%) who received inhalation anesthesia, 50% air + 50% oxygen mixture was preferred in 8 patients (19%). All patients received atropine and neostigmine to reverse the muscle relaxant effect.

The mean operation time of the patients was 239±49.9 minutes (min: 150, max: 394).

No patient had anesthesia-related complications during the perioperative period. No statistically significant relationship was found between the anesthetic gases used for the patients and the postoperative change in renal functions and biochemical values (p>0.05). Intraoperative fluid management was found

Table 1. Demographic Data

Gender (F / M) (n)	21 / 21
Age (mean±Std) (min, max)	38.5±11.9 (23, 62)
ASA 2 (n)	17
ASA 3 (n)	22
ASA 4 (n)	3
Body weight (kg) (mean±Std)	68.5±26
Duration of renal failure (months)	40.9±39

F: Female, M: Male, Std: standard deviation, min: minimum, max: maximum

Table 2. Etiology for Renal Failure

	n	%
Unknown	21	50
Hypertensive Nephropathy	5	11.9
Nephrolithiasis	4	9.5
Polycystic kidney disease	3	7.1
IgA Nephropathy	2	4.7
Membranous Glomerulonephritis	1	2.3
Focal Segmental Glomerulosclerosis	1	2.3
Diffuse Crescentic Glomerulonephritis (Goodpasture's Syndrome)	1	2.3
Familial Mediterranean Fever	1	2.3
Wegener Granulomatosis	1	2.3
Membranoproliferative Glomerulonephritis	1	2.3
Granulomatous Pyelonephritis	1	2.3
Total	42	100

Table 3. Anesthetics for Induction and Maintenance of Anesthesia

		n	%
Hypnotics	Pentothal	4	9.5
	Propofol	38	90.5
Neuromuscular Blockers	Atracurium	23	54.8
	Rocuronium	12	28.6
	Vecuronium	7	16.7
	Total	42	100.0
Inhalation agents	Isoflurane	12	28.6
	Desflurane	11	26.2
	Sevoflurane	17	40.5
Total intravenous anesthesia		2	4.8

that Crystalloid (0.9 % NaCl, Isolyte-S, Ringer lactate, 5% Dex 0.45% NaCl; mean (ml)-Std (ml)4238-1358, 83-290, 161-382,36-171, Total;4530-1339) Colloid (Hydroxyethyl starch; mean (ml)-Std (ml) 50-185) were used.

It was found that 35.24±9.69 mg mannitol and 84.05±28.03 mg furosemide were administered to the patients in the intraoperative period. The relationship between urine output and mannitol or furosemide dose after intraoperative anastomosis was not found to be statistically significant (p>0.05).

Intraoperative urine output was not observed in five patients after anastomosis and 14 patients (33.3%) required postoperative hemodialysis.

The mean duration of cold ischemia was 406.6±226 minutes (min: 73, max: 883). The need for postoperative hemodialysis is defined as delayed graft function. Longer ischemia time and cadaveric donor source are thought to be effective in its development. In our study, the duration of cold ischemia was found to be statistically longer in patients with delayed graft function (p<0.01). In addition, while delayed graft function was detected in 52% of cadaveric renal transplant patients, it occurred in only 5.9% of renal transplant patients with living donors (p<0.01).

There was no statistically significant difference in the analysis of anesthetic gas groups due to delayed graft function development (p>0.05).

Intraoperative follow-up revealed high blood pressure requiring treatment in 3 patients, two of whom were treated with esmolol infusion and the other with perlinganitis infusion. One patient was given insulin infusion upon the detection of hyperglycemia. Central venous pressure (CVP) values of patients at the end of the operation (12.07±5.01 mmHg) were significantly higher than those measured right before the operation (7.21±4.6 mmHg) (p<0.01). In the statistical analysis, it was found that the increase in CVP value had a statistically significant positive correlation with the intraoperative crystalloid amount (r=0.411, p=0.007).

In the postoperative period, only one patient was followed up in the post-anesthesia care unit while all the other patients were transferred to the nephrology unit. In the postoperative follow-up, one patient was transferred to the ICU on the 7th postoperative day due to multiple organ dysfunction syndrome (MODS) and died on the 9th day. This patient was thought to have developed cytokine storm due to Rituximab given for rejection therapy, resulting in MODS.

In our study, rejection was observed in 10 patients (23.8%). Seven of them responded to immunosuppressive therapies while 2 patients had to undergo nephrectomy through reoperation. One patient developed rejection approximately one year after the operation and returned to the dialysis program.

Postoperative follow-up revealed surgical complications (hematoma, renal artery stenosis) in 11 patients (26.2%). Postoperative renal artery stenosis was detected in 7 patients during the first five months. Four of these patients were treated with stent placement by interventional radiology, and three of them underwent reoperation and reanastomosis due to the detection of low flow rate in the renal artery at the doppler ultrasonography on the first postoperative day, with no additional pathologies in their follow-up. In addition, 4 patients developed perirenal collection drained from the incision at the operated area and were treated with a vacuum-assisted closure device.

One patient had nephrostomy secondary to the development of BK virus-induced ureteral stricture after the 6th month. This late complication was not included in the surgical complications. The patient is being followed up without the need for hemodialysis. Of the 42 patients we examined, 6 had to undergo reoperation for various reasons: Three patients had renal artery stenosis, one had suspected parenchymal necrosis (diagnosed as acute tubular necrosis and underwent no additional intervention), and two had rejection.

Fever was detected in the postoperative follow-up of 17

patients. In 7 patients, the fever responded to prophylactic antibiotic therapy despite negative culture results, 7 other patients had urinary tract infection and 3 patients had both urinary tract infection and respiratory tract infection. While nine patients recovered with antibiotherapy, 1 patient with urinary tract infection was admitted to the intensive care unit with MODS findings on the postoperative 7th day and died on the 9th day.

In our study, the mortality rate in renal transplantation at our hospital was found to be 2.38%.

It was analyzed whether the morbidity observed in the patients in the postoperative period differed according to the type of donor. The relationship between donor source and morbidity was statistically significant (p<0.05). While morbidity was observed in 29.4% of patients who underwent renal transplantation from living donors, morbidity rate was 72% in patients undergoing renal transplantation from cadaver. As seen, the morbidity rate is higher in cases where the donor is a cadaver (p<0.05). Postoperative morbidities were found that ; renal artery stenosis (living donor 3 and cadaveric 4), infection (positive culture result: living donor 1 and cadaveric 9), rejection (living donor 2 and cadaveric 8), nephrectomy secondary to rejection (living donor 0 and cadaveric 2), hematoma at the operated area (living donor 2 and cadaveric 2), ureteral stricture(living donor 0 and cadaveric 1), anemia (requiring ES replacement) (living donor 3 and cadaveric 5), MODS (resulting in death) (living donor 1 and cadaveric 0), Fever (negative culture result) (living donor 3 and cadaveric 4).

Discussion

Between May 2011 and October 2014, 42 patients underwent renal transplantation in our hospital. In our study population, 4 (9.5%) of 42 patients had undergone preemptive renal transplantation. In preemtive transplantations, patient and graft survival is better due to the fact that the recipient has not yet started dialysis and the systemic changes caused by renal failure are still minimal. In our study, renal transplantation in 17 (40.4%) patients was from living donors and in 25 (59.5%) patients from cadavers. The reason why cadaver transplants are more common in our hospital in comparison to the country average is the socio-cultural-economic characteristics of the patients admitted to our hospital. Namely, our patients cannot find living donors. However, the higher percentage of cadaver transplantation in our hospital should be acknowledged as the desired rate required for our country.

In our study, hypertensive nephropathy was detected in 5 patients (11.9%), primary renal disease in 16 patients (38%) and ESRF with unknown primer in 21 patients (50%) as etiological reasons. However, hypertension was detected in 10 of these patients with unknown primer.

When comorbidities were investigated, preoperative hypertension was seen in 18 patients (42.8%). Diabetes mellitus and ischemic heart disease are also common comorbidities. However, none of the patients in our study had preoperative diabetes or ischemic heart disease. Although goiter is not a common comorbidity with chronic renal failure, in our study, preoperative goiter was detected in 4 patients (9.5%). Anemia is common in patients with ESRF. In our study, 25 patients

(59%) had hemoglobin values of 12 g/dL and lower. The number of patients with hemoglobin concentration of 8 g/dL and lower was 3 (7.1%).

Prolonged cold ischemia time in transplantation preparation is an important risk factor for delayed graft function and graft loss [2]. The risk of delayed graft function increases by 23% every 6 hours during the period of cold ischemia [2]. Cold ischemia time should be kept as short as possible and should not exceed 24 hours [4]. In our study, the mean duration of cold ischemia was found to be 406.6±226 minutes. In a study by Aydoğan et al. [5], ischemia time was 158±110 seconds, total ischemia time was 450±178 minutes, and cold ischemia time was not fully specified. In our study, the duration of cold ischemia (524.64±138.88 minutes) was found to be statistically longer in patients with delayed graft function (p<0.01). The major reasons why cold ischemia time could not be shortened in our center are that organs are brought to our hospital from a long distance by land transport, most of our patients travel to the hospital from rural areas outside our province and have to wait for at least 5-6 hours for immunological matching analyses.

Immunosuppressive therapy, which starts in the preoperative period in renal transplantation, continues in the intraoperative period. All patients included in our study were treated with intraoperative anti-thymocyte globulin (ATG) and methylprednisolone. ATG could rarely have side effects due to cytokine release syndrome or possible anaphylaxis [6,7]. In our study, no side effects related to ATG were observed in patients in the intraoperative period.

For renal transplantation, most centers prefer general anesthetic techniques as they offer better hemodynamic stability, muscle relaxation and foreseeable anesthetic depth. All patients in our study had general anesthesia. There have been studies comparing anesthesia methods, none of these anesthesia methods seem to affect the success of transplantation more positively than the other [8]. In our study, total intravenous anesthesia was applied in 2 patients and inhalation anesthesia was used in 40 patients for the maintenance of anesthesia. In our study, no statistically significant relationship was found between postoperative renal function and anesthetic gases administered to the patients (p>0.05). In addition, in our study, no statistically significant relationship was found between the types of anesthesia administered to the patients in terms of laboratory values followed up according to days after renal transplantation (p>0.05). Our findings were not different from those in other studies in terms of anesthetic substances.

Arterial cannulation is rarely needed in perioperative blood pressure monitoring because preoperative preparation of renal transplantation patients is well- performed and excessive blood loss is seldom observed. However, serious fluctuations in blood pressure may be observed in some patients due to their coexisting diseases, which may require invasive arterial blood pressure monitoring [1,8]. In our study, arterial cannulation was performed in 22 patients (52.4%) for intraoperative blood pressure monitoring. Hypertension in 6 patients and morbid obesity in one patient were the only co-morbid diseases. The arterial cannulation rate of 52.4% may be attributed to the anesthesiologist's personal preference or to the fact that anesthesiologists may request a stricter follow-up for blood

pressure since cadaveric renal transplants are performed in emergency conditions and there is limited time for preoperative preparation.

In patients with hypertension, there might be fluctuations in peroperative blood pressure. In our study, 3 patients had high blood pressure requiring intraoperative treatment. In a large case series, the incidence of hypotension (49.6%) was reported to be higher than hypertension (26.8%) in the intraoperative period [1]. In our study, no patient had intraoperative hypotension requiring treatment.

Central venous pressure (CVP) measurement is as important as blood pressure measurement in renal transplantation patients. The aim of CVP monitoring is to keep CVP between the values of 10-15 mmHg in order to optimize cardiac output and renal blood flow [1]. In our study, central venous pressure (CVP) values of the patients at the end of the operation (12.1±5.0 mmHg) were significantly higher than those measured right before the operation (7.2±4.6 mmHg) (p<0.01). The statistical analysis showed that the increase in CVP value showed a significant positive correlation with intraoperative fluid regimen (r=0.411, p=0.007).

Furosemide is known to reduce the activity of the antidiuretic hormone and increase resistance to ischemia. Mannitol, on the other hand, is known to increase renal blood flow and act as a protection against tubular necrosis and free radicals. Loop diuretics and mannitol can be used to increase diuresis in the kidney [8]. In our study, it was found that mannitol and furosemide, a loop diuretic, were administered together and 35.2±9.8 g mannitol and 84±28 mg furosemide were administered to all patients. In 37 patients, urine output was observed after intraoperative anastomosis, while no urine output was observed in 5 patients, and no statistically significant result was found between mannitol or furosemide dose and urine output after anastomosis (p>0.05). This finding is different from those previously published in the literature [9,10].

In addition to the use of mannitol and diuretics to generate diuresis, it is also important to ensure adequate circulation volume [8]. Dawidson et al. [11] reported that urine output was delayed after reperfusion in patients with a blood volume under 70 mL/kg. In recent years, there have been controversies about whether a certain crystalloid fluid is better than others for postoperative renal function. An extensive survey study conducted at 49 hospitals in the USA showed that normal saline-based solutions were used during transplantation in more than 90% of the patients [12,13]. However, in a prospective, randomized, controlled and double-blind study comparing the use of normal saline and Ringer's lactate solution in intraoperative fluid management for renal transplantation, a higher rate of severe hyperkalemia and metabolic acidosis was observed in the normal saline group. In their study, Aydoğan et al. [5] reported that 2129±1024 ml 0.9% sodium chloride solution was administered to the patients on average. In our study, it was found that patients were intraoperatively given an average of 4530±1339 ml crystalloid solution in total, and the value for each type was as follows: 4238±1358 ml 0.9% sodium chloride, 83±290 ml isolyte-s, 161±382 ml Ringer's lactate and 36±171 ml 0.45% sodium chloride + 5% dextrose

solution. It was found that the most frequently used solution by anesthesia specialists in our clinic for renal transplantation cases was 0.9% sodium chloride solution, followed by Ringer's lactate solution. No statistically significant hyperkalemia was observed in the patients (p>0.05).

In total, a colloid solution containing hydroxyethyl starch was used in only three patients, at a mean amount of 50±185 ml. In one of these patients, renal vein thrombosis developed on the first postoperative day and the allograft was lost. Heta starch has a side effect of nephrosis and there are opinions that it should not be administered in renal transplantation [14].

Since blood loss is usually minimal in renal transplantation, the need for transfusion is rare [8]. No patient in our study received blood or blood product replacement.

Following transplantation, urine output is observed in more than 90% of renal transplants from living donors and in 40 % to 70 % of cadaveric renal transplant recipients [1]. In our study, 37 patients had diuresis after anastamosis and 5 patients had no urine output in the intraoperative period after anastamosis. All of these 5 patients had renal transplantation from cadaver. One patient was found to have severe renal artery stenosis with postoperative Doppler ultrasonography (Doppler USG), and had to be reoperated to renew the anastomosis. Urine output was observed after the second operation. Another patient developed acute antibody-mediated rejection, failed to respond to treatment, and underwent graft nephrectomy. The other three patients required postoperative intermittent hemodialysis. In these patients who were considered to have delayed graft function, renal functions recovered later on, and they are still followed up with functional kidneys.

The incidence of postoperative admission of renal transplantation patients to ICU is generally low, found to be around 1% in a large series. Sepsis or excessive fluid load was observed in patients who had to be transferred to ICU [15]. In our study, it was found that one patient was admitted to the ICU due to MODS on the postoperative 7th day and died on the 9th day. One patient was admitted to the post-anesthesia care unit due to late postoperative recovery and low oxygen saturation, and transferred to the ward after oxygen treatment with a mask for about 4 hours.

Postoperative pain in patients after renal transplantation is usually mild to moderate [1]. It is recommended to avoid the use of NSAI in patients undergoing transplantation and in all patients with renal dysfunction [8]. In our study, it was seen that NSAI was not preferred, instead, tramadol was used for postoperative analgesia in patients. However, since there is no routine evaluation with a pain scale, statistical data are not available.

The success of long-term outcomes of renal transplant recipients depends on the successful management of perioperative and early postoperative periods [16]. Early surgical complications such as delayed graft function, acute rejection attacks, urinary leakage or vascular complications and sepsis are among the important factors affecting long-term outcomes [16].

Delayed graft function is the most common complication in the early postoperative period [17]. In an analysis of 107787 cadaveric renal transplantations between 1987 and 2001, the incidence of delayed graft function was found to be

approximately 23% in cases with standard donor criteria and approximately 34% in those with expanded donor criteria [18]. In our study, delayed graft function was found in 14 patients (33.3%). The reason for this high rate is that transplantations in our center are mostly from cadavers, and the cadaver donors are mainly composed of expanded criteria donors. Three of these patients had acute tubular necrosis, 6 had acute antibody-mediated rejection, 1 had acute T-cell mediated rejection and another had renal artery stenosis. One patient died due to MODS on the 9th postoperative day. Graft nephrectomy was performed in 2 of the patients who had rejection, and a patient who developed acute T-cell rejection about one year after the operation had to restart dialysis. Except for these 3 patients and 1 exitus patient, renal functions in the other 10 patients returned to normal with the appropriate treatment, and these patients are still followed up with functional grafts. In our study, while delayed graft function was detected in 52% of cadaveric renal transplant patients, the incidence rate was 5.9% in renal transplant patients with living donors (p<0.01). In our analysis, the difference between the administered anesthetic gases in terms of delayed graft function development was not found to be statistically significant (p>0.05).

In our study, rejection was observed in 10 patients (23.8%). While two of these developed acute T-cell mediated rejection, the other 8 patients had acute antibody-mediated rejection. It was found that 7 patients who developed rejection were discharged with functional grafts whereas 2 patients underwent graft nephrectomy through reoperation. One patient who developed rejection approximately one year after the operation had to return to the dialysis program.

Surgical complications such as hematoma and renal artery stenosis were observed in 11 patients (26.2%) in the postoperative period. Renal artery stenosis is the most common vascular complication after renal transplantation, with an incidence ranging between 1% and 23% [19]. In our study, renal artery stenosis was detected in 7 patients (16.6%) in the first five postoperative months. Hematoma at the operation area was detected in 4 patients (9.5%) and treated with vacuum drainage.

In developed countries, post-transplant infection rates have dramatically decreased from 70% to 40%, accompanied by a decrease in mortality rates from 40% to 5%. However, developing countries are still fighting against these problems [20]. Infections worsen the course after transplantation in 50% to 75% of recipients and cause mortality at rates ranging between 20% and 60% [20]. Most of the infections seen in the early postoperative period are associated with surgery. Generally, wound site infection, central catheter-induced bacteraemia, urinary tract infection or pneumonia is observed [21]. In India, the incidence rate of pneumonia in the early period after renal transplantation was reported to be 18% [22]. In our study, the incidence of infection in patients was 23.8% in the post-transplant period until discharge from the hospital; 70% of these were urinary tract infections and in 30% of them, urinary tract infection was accompanied by respiratory tract infection. Seven patients (16.6%) with fever but negative culture results were not included in this rate of 23.8%.

Postoperative complications in the patients were reviewed

and considered as morbidity, and it was analyzed whether they differed according to donor type. There was a statistically significant relationship between donor source and morbidity (p<0.05). While 29.4% of patients undergoing renal transplantation from living donors had morbidity, this rate was 72% in cadaveric renal transplant recipients.

In our study, one patient died on the 9th postoperative day and the mortality rate was calculated as 2.3%. In many recent series, it has been reported to range between 0.03% and 0.6% [16].

In studies by Aydoğan et al. [5], Dogukan et al. [23], and Sağıroğlu et al. [24], 32 out of 33 (96.9%), 20 of 30 (66.6%), and 52 (92.8%) of 56 renal transplant patients, respectively, were reported to have functional grafts. Of the 42 patients who underwent renal transplantation in our hospital between May 2011 and October 2014, 38 (90.4%) still have functional grafts. Outcomes of renal transplantation are affected by factors such as differences in the experience of centers, patient diversity, donor source, immunosuppressive treatment regimens, follow-up periods and patient compliance. In many countries, 1-year survival rates in renal transplantation patients have been reported to be over 90% in the 1990s and since 2000s [25]. The survival rate of 42 renal transplant patients treated in our hospital between May 2011 and October 2014 has been 97.6%.

Conclusion

The successful management of the problems that may be encountered in the perioperative period in renal transplant surgery plays an essential role in preventing graft and patient loss.

There is no single method and drug group for effective and reliable anesthesia management in renal transplantation patients. We believe that our main aim is to stabilize the hemodynamic parameters of the patients independent of the anesthetic agents used, and thus, to ensure adequate perfusion of the graft kidney.

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